THE VERNATION OF SALIX.

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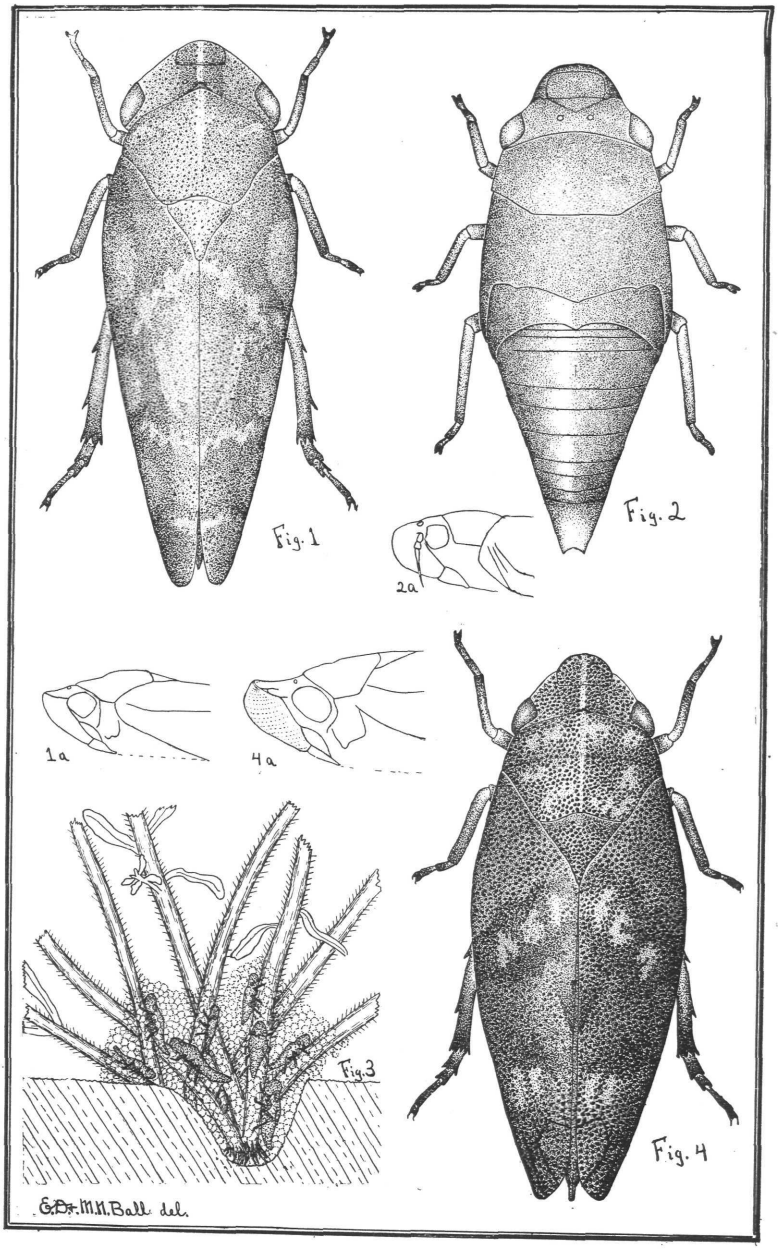
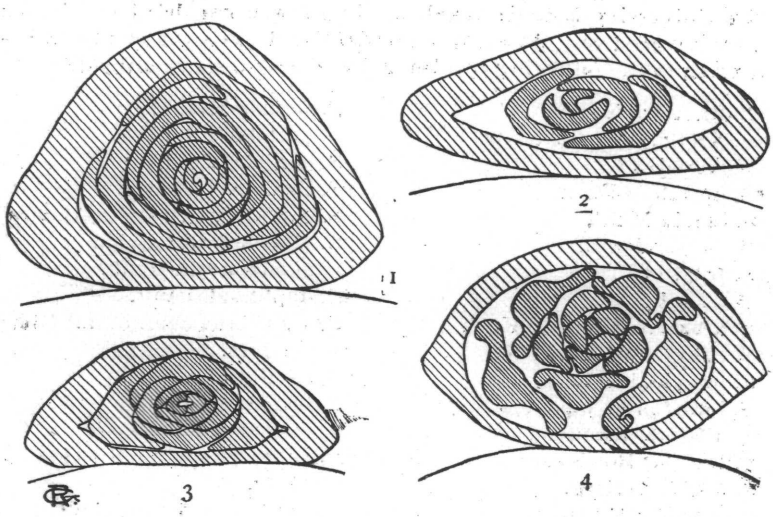
Most of the manuals are entirely silent regarding the vernation of the Willows. Sargent* describes their leaves as "variously folded in the bud" and under different species gives them as: involute, revolute, convolute, and even conduplicate in the bud. The fact that he gives two species, closely related and difficult to distinguish, at the time the buds open (Salix nigra and S. amygdaloides), as having involute and revolute vernations, led me to take up the matter to see if a key for their identification from bud characters, could be constructed.

Not only did I find that they were not involute and revolute respectively; but that they were neither involute nor revolute, but both imbricate. On examining other species the same thing was found. The only exceptions to the true imbricate vernation found are represented in figures 3 and 4. The section Purpureae, on account of its tendency to have opposite rather than alternate leaves, often forms such decussate buds as are shown in figure 3. In Salix incana Schrenk, a species whose leaves at maturity have revolute margins, the leaves have a greater or less tendency to roll backwards in the bud. The most extreme case found is shown in figure 4. Others from the same twig could be shown where the leaves show only the slightest tendency to be revolute. If we may consider that

* Sargent: Silva of North America 9: 95.



BALL ON APHROPHORA LARVAE.



this backward turning is merely a character of the mature leaf manifesting itself in the bud it is evident that there is here no revolute vernation but that it is really imbricate.

The other buds examined vary from the form represented in figure 1 where the whole interior of the bud is taken up with the closely packed leaves, to that shown in figure 2 where there are a few leaves with a great deal of wool.

Species like Salix fragilis L. whose leaves are glabrous when they unfold have buds like the former while species like Salix discolor Muhl., with leaves excessively wooly when they unfold, are like the latter. As there are all intergradations between these two kinds of leaves, there is naturally a series of buds between these two as extremes. While further investigation is necessary before we would be warranted in declaring that the vernation of the whole genus is imbricate; yet the fact that specimens of thirty-four species and varieties, taken from thirteen of the nineteen sections given by Andersson in DeCandolle's prodromus, have their leaves imbricated in the buds would seem to establish a presumption in favor of such a view.

The buds examined were soaked in 70 % alcohol and free-hand sections cut and mounted in balsam. On account of scarcity of material, the buds of several species were not sectioned but dissected on the growing plant. Such are marked with an asterisk (*). As far as possible living material was taken, mostly from native plants. Those species not native were studied from specimens growing in

the University Botanic Garden. In a few cases dried specimens were resorted to. About one hundred and twenty-five plants belonging to the following species and varieties were examined.

Salix nigra Marsh.
S. amygdaloides Anders.
S. triandra L.
*S. undulata Ehrh.
S. lucida Muhl.
S. pentandra L.
S. fragilis L.
S. alba L.
S. alba vitellina (L.) Koch.
S. babylonica x fragilis.
S. babylonica L.
S. babylonica japonica (Thumb) Anders.
S. interior Rowlee.
S. bebbiana Sarg.
S. discolor Muhl.
S. myrtilloides L.
S. humilis Marsh.
S. tristis Ait.
S. sericea Marsh.
S. petiolaris Sm.
S. cordata Muhl.
*S. cordata x sericea.
S. cordata var. vestita Anders.
S. glaucophylla Bebb.
S. adenophylla Hook.
*S. daphnoides Vill.
S. smithiana acuminata (Sm) Anders.
S. candida Fluegge.
S. incana Schrenk.
S. purpurea L.
*S. rubra purpureoides Gen. & Godr.
*S. candicans Gen. & Godr.
*S. laurifolia Gen. & Godr.
*S. sieboldii Gen & Godr.

EXPLANATION OF THE FIGURES.—Fig. 1. Salix fragilis L. Bausch and Lomb obj. ⅔ oc. 2.
Fig. 2. S. discolor Muhl. B. & L. obj. ⅔ oc. 2.
Fig. 3. S. purpurea L. B. & L. obj. ⅔ oc. 2.
Fig. 4. S. incana Schrenk. B. & L. obj. ⅔ oc. 1.
The figures were drawn with an abbe camera lucida and reduced to 2-5 of their original size.